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OFFICE OF
AIR AND RADIATION

Summary of Rationale for the ENERGY STAR® Refrigerated Beverage Vending Machine Specification

I. Introduction and Background

This memorandum provides a summary of EPA's rationale in developing the new ENERGY STAR refrigerated beverage vending machine specification. It contains the following information:

- Summary of the key requirements of the specification
- Key milestones in the development of the specification
- Summary of key comments provided by stakeholders throughout the development process
- EPA's rationale for deciding on key elements of the Final specification

II. Summary of Key Requirements

The following are the key requirements of the refrigerated beverage vending machine specification:

- Only new machines are eligible to earn the ENERGY STAR.
- All machine types (solid door, glass door, live display, temperature sensitive, etc.) are eligible to earn the ENERGY STAR.
- Qualifying models must meet the performance and low power mode requirements provided below.

Performance Requirements:

Tier I: $Y = 0.55\ [8.66 + (0.009 \times C)]$
Tier II: $Y = 0.45\ [8.66 + (0.009 \times C)]$

Y = 24 hr energy consumption (kWh/day) after machine stabilization
C = vendible capacity

The energy consumption equation is based on CAN/CSA C804-96 *Energy Performance of Vending Machines* (for Machine Type A).

Low Power Mode Requirements: Machine shall be capable of operating in each of the low power mode states described below:

1. Lighting low power state – lights off for an extended period of time.
2. Refrigeration low power state – the average beverage temperature is allowed to rise above 40° F for an extended period of time.
3. Whole machine low power state – the lights are off and the refrigeration operates in a low power state.

In addition, the machine must be able to automatically return itself back to normal operating conditions at the conclusion of the inactivity period. The low power mode controls/software must be capable of on-site adjustments by the vending operator or machine owner.

- Testing requirements are based on UL Indoor and Outdoor machine designations. Machines designated as "Suitable for Outdoor Use" by UL must meet the performance requirements when tested at 90±2 °F (32.2±1 °C); 65±5% relative humidity; and 36±1 °F (2.2±0.5 °C) average beverage temperature throughout the test. Machines designated as "For Indoor Use Only" by UL must meet the requirements when tested at 75±2 °F (23.9±1 °C); 45±5% relative humidity; and 36±1 °F (2.2±0.5 °C) average beverage temperature throughout the test. Machines that are designated as indoor/outdoor use must be tested under the "For Outdoor Use" requirements.
- Manufacturers must include the ENERGY STAR mark on either the front of the machine or next to the machine nameplate, which is typically found on the side of the machine.
- Due to the importance of remanufactured/refurbished machines within the vending machine market, EPA is continuing to work with industry stakeholders on requirements for these machines and expects to amend the current specification over the next year to include them.

III. Key Milestones of Specification Development

EPA initially considered developing an ENERGY STAR specification for refrigerated beverage vending machines in 1996. More recent efforts to develop a refrigerated beverage vending machine specification took place over the course of 18 months and included the following key milestones:

- Industry stakeholder meeting held in conjunction with the InterBev show on October 22, 2002.
- Three draft versions of the specification released for stakeholder comment prior to finalization.
- Launch of the new specification at the National Automatic Merchandising Association (NAMA) Spring Expo, April 1-2, 2004.

IV. Summary of Stakeholder Input

In developing the product specification EPA considered comments provided during the October stakeholder meeting as well as written comments submitted to EPA by equipment manufacturers and other industry stakeholders. All stakeholder comments were posted to the ENERGY STAR Web site, with permission of the submitter, throughout the development process. The key comments are summarized below, along with EPA's responses.

Definitions and Qualifying Products

- Stakeholders suggested that instead of the term "machine" capacity, EPA should use the term "vendible" capacity, which is used in the current ASHRAE 32.1-1997 standard. A suggestion was also made to use the definition for "standard product", which is provided in the ASHRAE 32.1-1997R standard. There are other product types that can now be vended, other than cans, and the machine should be tested using whatever is specified by the machine manufacturer, if not cans.

  EPA Response: Agreeing with these comments EPA used the definitions for vendible capacity and standard product that appear in Section 3 of the ASHRAE 32.1-1997 standard.

- In the Preliminary Draft specification EPA excluded machines that are designed to vend temperature sensitive product due to the inherent differences in internal design and tighter (continuous) temperature requirements (35 – 40 degrees F). However, many stakeholders felt that if a particular machine can meet the eligibility criteria then it should be allowed to qualify and bear the ENERGY STAR mark, regardless of the products that they are designed to vend.

  EPA Response: EPA removed the exclusion of temperature sensitive machines from the specification. All refrigerated beverage vending machines, regardless of the products that they vend, can qualify as ENERGY STAR. However, EPA did include a note stating that "…machines that are vending temperature sensitive product, such as milk, must not have the refrigeration low power state enabled on site by the vending operator or machine owner due to the risk of product spoilage."

- For similar reasons, EPA initially excluded glass front machine models in the Preliminary Draft specification. A number of stakeholders felt that with the increasing market penetration of glass front machines, ENERGY STAR should recognize this machine type. However, stakeholders also felt that these machines should be allowed to be tested and qualify within the environment where they most likely will be placed – indoors. Many of them pointed to the most recent revisions to the ASHRAE 32.1-1997R testing standard, which added a new requirement that machines be tested under both 75° F and 90° F to simulate both indoor and outdoor conditions.

  A few stakeholders were concerned that since the CSA performance equation was originally based on closed front machines tested at 90° F, using it to qualify glass front machines under 75° F test conditions was not accurate and requested that EPA wait until the appropriateness of the CSA equation for glass front machines could be evaluated.

  EPA Response: In the absence of any data indicating a clear problem with using the CSA performance equation for glass front machines, EPA decided to include the glass front machines under the ENERGY STAR Tier I specification. Doing so provides the opportunity

to collect data necessary to more precisely evaluate the appropriateness of using the equation for these machines for subsequent tiers.

EPA recognizes that most glass front machines are designed for indoor use only and agrees that it is important to test under conditions that are relevant to where they will be placed. Therefore, EPA adopted the ASHRAE 32.1-1997R testing protocol for testing glass front machines using the following guidelines:

> *Machines marked "For Indoor Use Only" must be tested at 75±2 °F (23.9±1 °C); 45±5% relative humidity; and 36±1 °F (2.2±0.5 °C) average beverage temperature throughout the test.*
>
> *Machines marked "Suitable for Outdoor Use" or "Suitable For Protected Locations" must be tested at 90±2 °F (32.2±1 °C); 65±5% relative humidity; and 36±1 °F (2.2±0.5 °C) average beverage temperature throughout the test.*

To qualify as ENERGY STAR the manufacturing partner is only required to report energy performance for the scenario which corresponds to the machine's UL designation.

- Some stakeholders had expressed concern with the specification only allowing newly manufactured machine models (e.g., those not yet placed on-site) to qualify as ENERGY STAR. They felt that as long as the machines in the field are identical to the model qualified as ENERGY STAR they could also bear the ENERGY STAR label.

  EPA Response: EPA understands that some of the machines that will initially qualify as ENERGY STAR under Tier I have been selling in the marketplace 2-3 years prior to the specification becoming effective and the label being available. The only concern with labeling machines in the field as ENERGY STAR is ensuring that they have not been refurbished and/or remanufactured, changing the interior design and potentially the engineering of the machine. To address this concern and to protect the integrity of the ENERGY STAR mark, EPA included the following statement within the specification:

  > *This Version 1.0 specification applies to new machine models and machines in the field that are identical to the models that are ENERGY STAR qualified as new machines. The ENERGY STAR label may be affixed to those qualified field machines once the qualifying product information is posted on the ENERGY STAR Web site.*

Labeling and Program Requirements

- During the specification development process one of the stakeholders warned EPA that unit shipment data [collection] may not translate into actual market penetration since in many cases, machines are shipped by the manufacturer to a distributor warehouse and not placed on-site until the following year or later.

  EPA Response: This is a requirement of ENERGY STAR Partners in all product categories. However, EPA recognizes that this approach may not be the best for certain products and is willing to work with manufacturers and other industry stakeholders to determine the best way to calculate market penetration within the vending machine sales and distribution channel so that ENERGY STAR qualified machine penetration can be most accurately represented.

- EPA received a number of suggestions regarding where the ENERGY STAR mark should and/or should not be placed on the machine. Some stakeholders were concerned with placing the ENERGY STAR mark on the front of the machines because: (1) the front panel is important real estate that is reserved for advertising purposes and any additional labels could be inconsistent with the intended marketing messages and (2) promoting ENERGY STAR qualified machines could be damaging to the existing installed base until a refurbished machine specification is developed and both new and retrofitted machines bearing the ENERGY STAR mark are available for bottlers and distributors to meet customer demand.

  However, many stakeholders felt that it was important to place the ENERGY STAR mark on the front of the machine so that utilities can identify and provide incentives for the qualified models in the field and end users could identify compliant models. Another suggestion was to place the ENERGY STAR mark inside the machine for a few years while the industry works on the refurbished specification then move it to the outside at a later date. One suggestion that received the most support was to include the ENERGY STAR on or next to the machine manufacturer nameplate where other certifications, such as UL, currently appear.

  EPA Response: EPA considered all of these concerns and suggestions and decided to give manufacturers more than one labeling option: place the ENERGY STAR either on the front of the machine or next to the nameplate of the machine. EPA believes that visibility of the ENERGY STAR mark on qualifying models is important as it is the primary way to build awareness of ENERGY STAR, which serves to benefit all partners. EPA recognizes that most machine purchases/choices are made without the host site actually seeing the machine, and in that case, the ENERGY STAR mark may not sway the placement/purchasing decision. However, it is important that once the machine is placed on-site, the end user that requested an ENERGY STAR qualified machine is assured of the energy savings because they see the mark on the machine when it is delivered. Taking into consideration stakeholder concern with advertising space on the front of the machine and the importance of identifying machines in the field, EPA gave manufacturers a choice of either labeling the front of the machine or the side of the machine, near the nameplate.

Energy Efficiency Performance Requirements

- One stakeholder questioned the use of the CSA equation to determine energy efficiency levels. Specifically, they were concerned that the relationship between can capacity and daily energy consumption may not be linear.

  EPA Response: EPA chose to use the CSA equation because it is still the standard being used to test and compare machines within this industry and all of the equipment manufacturers were involved in its development. In addition, there is no comparable and/or widely accepted alternative protocol for comparing machine energy performance.

- EPA first proposed including a low power mode that would be programmed prior to the manufacturer shipping it to the customer. However, stakeholders felt that it would be difficult to determine a default program that would be applicable to all machine placement (i.e., host site) scenarios.

  EPA Response: EPA recognized that each site has unique operation conditions and removed the requirement that manufacturers pre-set low power mode features prior to shipping.

— With the removal of the default requirement, some stakeholders then questioned the need for a low power mode requirement if the manufacturer who ships the machine is not responsible for programming it on-site.

EPA Response: While neither EPA nor the machine manufacturer can control whether or not the software is programmed on-site, the low power mode requirement ensures that the operator and host site are at least presented with this option. EPA expects that through manufacturer training and operator outreach to the host sites, these controls will be properly used to maximize energy savings while meeting the operational needs of the site.

— In the Preliminary Draft EPA proposed requiring that the machine be equipped with low power mode related controls or software capable of reducing light levels by 20% and allow refrigeration temperatures to rise above 50° F during periods of inactivity. A number of stakeholders thought that EPA should be less prescriptive while others were concerned that the machine would simply be unplugged in order to achieve this low power mode.

EPA Response: EPA's goal in including this requirement was to ensure that the low power capabilities are being used to their fullest potential based on the requirements of the host site. To be less prescriptive, EPA removed the 20% requirement, but left the temperature requirement to ensure maximum energy savings. In addition, EPA lowered the temperature requirement to 40° F to address concerns regarding the delivery of warm product.

EPA also added the following sentence to Section 3B of the specification to address the fear of the machine being unplugged to meet the low power mode requirements, as opposed to a software program actually being incorporated into the machine:

> *"……capable of automatically placing the machine into a low power mode during periods of extended inactivity while still connected to its power source to facilitate the saving of additional energy, where appropriate*."

— Setbacks, or low power mode, may affect milk and other temperature sensitive machines. While stakeholders felt that these machines could meet the Tier I performance requirements, there was some concern that requiring temperature sensitive models to power down the refrigeration would potentially spoil the vended product.

EPA Response: EPA understands that there may be cases where powering down the refrigeration is not appropriate. However, it is also difficult to predict whether a machine currently vending milk or other sensitive product will, in the future, vend a less temperature sensitive product such as soda. Therefore, EPA is requiring all machine models to have the capability to enter into low power refrigeration mode to ensure the possibility of additional energy savings throughout the life of the machine. EPA expects that through education to the bottlers and host sites, these controls will be properly used to maximize energy savings without interfering with product sales or freshness.

-- It was brought to EPA's attention that machines exist in the marketplace that do not include lighting systems and/or refrigerate at temperatures higher than the ENERGY STAR low power mode requirement of 40 degrees F.

EPA Response: If a machine meets all low power mode requirements under normal operation, it may qualify as ENERGY STAR without a low power mode feature as long as it meets all remaining performance and testing requirements of the specification. The Qualifying Product Information (QPI) form now addresses refrigerated beverage vending

machines that are designed to operate at low power levels continuously. The QPI form requires partners to indicate whether or not the machine was shipped with low power mode capabilities by checking either "yes" or "no." Manufacturers of those machines that normally operate in a low power mode should check "no" and provide an explanation as to why this is the case. EPA will follow up with manufacturers of these machines to verify that the specification is being met.

Refurbished/Remanufactured Machines

- All stakeholders felt that it was important for EPA to address the existing machine base, in addition to new machines, when developing the specification. Many felt that EPA was missing an opportunity to address some of the older machines still found in the field and capture large energy and environmental savings. Some stakeholders were worried that excluding existing machines from the specification could create a demand for new machines that would be challenging for the industry to supply. Many of these older machines could be retrofitted with high efficiency components and meet the Tier I ENERGY STAR performance levels today.

  However, there also was a general understanding that there are a number of issues that need to be resolved before EPA could include refurbished/remanufactured machines in the ENERGY STAR specification. For example, once the components of a machine are replaced, the machine loses its original UL certification. EPA would like to expand the specification to refurbished machines in such a way that the UL certification is maintained after going through the retrofit process.

  There was a general consensus that when incorporated into the specification these machines should meet the same performance levels as new ENERGY STAR qualified machines.

  EPA Response: EPA recognizes the uniqueness of the vending machine distribution channel and realizes that expanding the specification to refurbished machines would ensure even higher market penetration of energy-efficient machines and a further reduction in energy usage, which is ultimately the goal of ENERGY STAR. However, there was still work to be done to determine how a refurbished/remanufactured machine specification would be determined, implemented, and managed. EPA did not want to delay the finalization and effective date or the new machine specification in order to research these issues further, primarily because some manufacturers were already designing new machines to meet the ENERGY STAR specifications.

  Within the Final specification, EPA committed to working with stakeholders to extend the vending machines specification to refurbished/remanufactured machines within one year of the Tier I effective date, April 1, 2005. A Draft 1 Strawman was distributed to industry stakeholders during the specification development process that proposed qualification, testing, and partner requirements under a potential refurbishment program in order to open these discussions. EPA will continue to work with equipment manufacturers, beverage companies, bottling companies, NAMA, and Underwriters Laboratory (UL) to determine the most effective way to address the installed base of refrigerated beverage vending machines. Any refurbishment program requirements, once completed, will be added to the specification as an amendment.

Effective Date

- A number of industry stakeholders were concerned with the amount of time initially provided between Tiers I and II (12-18 months). Many felt that 2 years was unreasonable primarily because the industry is currently in an economic slump making it extremely difficult for manufacturers to expend money on R&D efforts. Manufacturers argued that to achieve the Tier II levels a number of costly technological changes will need to be made to existing machine designs. It was suggested that manufacturers have at least 3 years before being required to meet Tier II requirements.

  EPA Response: To address these concerns EPA extended the time between Tier I and Tier II effective dates to 3 years. Approximately 2 years from the April 1, 2004 Tier I effective date, EPA will revisit the Tier II requirements to determine if they continue to be feasible given the technologies in the marketplace.

- Some stakeholders were concerned with the multiple tiered format and thought that EPA should have one set of requirements and then revise the specification, if necessary, at a later date.

  EPA Response: EPA's intent in using multiple tiers is to give manufacturers an opportunity to qualify existing products while also providing a road map for future design of new machines to meet Tier II requirements. EPA has successfully implemented similar tiered approaches in a number of other ENERGY STAR product specifications. To ensure that the Tier II levels continue to be appropriate based on technologies found in the marketplace and qualified products will be available once the tier goes into effect, EPA will revisit the specification approximately one year prior to the Tier II effective date.

- EPA had intended to finalize and announce the vending machine specification at the NAMA Expo in October 2003. However, based on the volume of comments received on the Draft 1 specification additional time was needed to review, research, and address a number of outstanding issues prior to finalizing.

  EPA then proposed a Tier I effective date of January 1, 2004 in the Draft 2 version. However, following the release of Draft 2, EPA continued to receive a number of comments and concerns regarding refurbished/remanufactured machines. EPA then took the next few months to sort out these issues and included the following statement in the final specification, which was launched at the NAMA Spring Expo on April 1, 2004: "*Requirements for refurbished machines will be determined within one year of the effective date provided in Section 5…..*"

V. EPA Rationale for Specification

EPA uses a consistent set of criteria in the development and revision of specifications for ENERGY STAR qualified products. These criteria guide EPA in its decision making and help EPA ensure that ENERGY STAR will continue to be a trustworthy symbol for consumers to rely upon as they purchase products for the home or business and so that their purchases will deliver substantial environmental protection. These criteria include:

- Significant energy savings and environmental protection potential on a national basis;
- Product performance is maintained or enhanced;

- Qualified products will be cost-effective to the buyer;
- Efficiency can be achieved with several technology options, at least one of which is non-proprietary (i.e., not exclusive to proprietary technology);
- Product differentiation and testing are feasible; and
- Labeling would be effective and recognizable in the market.

Below EPA addresses the refrigerated beverage vending machine specification relative to each of these criteria.

- *Expected Energy Savings and Environmental Benefits.* EPA projected that these ENERGY STAR product categories would offer the following annual unit energy savings:

    - Machines that earn the ENERGY STAR are 35% more energy-efficient than standard new machine models. Since vending machines have equipment lifetimes of 10 years or more it is assumed that these savings would increase significantly when replacing an existing, older machine with a new ENERGY STAR qualified model.
    - Each ENERGY STAR qualified vending machine can save building and business owners 1,300 kWh/year or $90/yr in electricity costs.

- *Product Performance is Maintained or Enhanced.* When setting the performance levels, EPA used existing machine data provided by the National Automatic Merchandising Association (NAMA) on behalf of their manufacturing members as well as a manufacturer-reported data provided by the California Energy Commission (CEC). EPA believes that the Tier I levels represent the most efficient vending machines models already offered in the marketplace today without the need for major engineering changes to the machines. EPA also believes that the changes required to bring a Tier I machine up to Tier II levels will benefit overall machine performance including: more efficient and longer lasting compressors and lighting systems, ensuring that the machine stays in operation and requires less maintenance.

- *Cost-effectiveness.* This was a difficult item to address given the split incentive situation that vending machines present: the host site that receives the energy benefits of a more energy-efficient machine is not the purchaser/owner of the machine, i.e., the one that pays the incremental first cost of purchasing the energy efficient machine. For the host site, the payback is immediate since they do not have to purchase the machine. For the machine owner there are some additional benefits to ENERGY STAR qualified machines: more efficient and longer lasting lighting systems and refrigeration components which equate to fewer maintenance calls. It is also EPA's expectation that by carrying and offering ENERGY STAR qualified vending machines, distributors that participate in the program early will attract new accounts that are looking for ENERGY STAR as a solution to lowering utility bills.
- *Several Technology Options, including some with Non-proprietary Technology*. EPA believes that several options exist for improving the energy performance of refrigerated beverage vending machines. These options will only increase once EPA incorporates a refurbished/remanufactured machine specification. There are a number of machine components that could be made more efficient in order to meet the ENERGY STAR performance requirements including: more efficient lighting systems, compressors, and fan motors and improving cabinet insulation.

- *Product Differentiation and Testing Procedure*. While developing the specification EPA was able to review and analyze machine performance data supplied by NAMA on behalf of its members and a database supplied by the California Energy Commission (CEC). Based on this test data and discussions with equipment manufacturers, EPA believes that those models that are able to meet ENERGY STAR requirements represent the top performers within the marketplace.

  When setting specifications EPA typically tries to capture the top 25% of existing inventory, however in this case, new machines represent only about 5% of the market. Therefore, EPA set the transitional Tier I specification so that about 80% of new machines could qualify. In an attempt to have a greater impact on the existing market base and ensure that at least one model within each size category was represented. EPA then set the Tier II requirement so that approximately 20% of existing machines meet the levels in order to bring the specification back in line with ENERGY STAR Guiding Principles.

  The specification uses the latest version of the revised ASHRAE 32.1-1997R standard, which is already being used by manufacturers to test total energy consumption (kWh/day) of the machine. Once this standard is made final EPA will update the specification to include the new reference, if necessary.

- *Labeling*. EPA believes the ENERGY STAR mark serves an important role in the marketplace due to the absence of any other objective basis for end users to identify and manufacturers to promote highly efficient refrigerated beverage vending machines.

  Refrigerated beverage vending machines are procured in the same manner as many other commercial products being purchased and leased by large institutions such as universities, hotels, hospitals, and federal facilities that are very familiar with ENERGY STAR. EPA expects that these large purchasers will begin writing ENERGY STAR qualified vending machines into their procurement language when renewing their beverage contracts. These purchasers look to ENERGY STAR to identify the most energy-efficient products available in the marketplace and they will now be able to do so for vending machines.

  Furthermore, with the requirement to label on either the front of the machine or next to the machine nameplate ensures that qualified machines can be identified in the field by utilities and host sites to ensure compliance.

  In addition, the Federal Energy Management Program (FEMP) is encouraging federal agencies to ask for ENERGY STAR qualified machine models when renewing contacts with their distributor. The ENERGY STAR Qualified Product List provides the end user and the distributor with an easy way to identify energy-efficient machines that are available.